11.0 WATER RESOURCES

This chapter contains information concerning water resources located in the proposed LYNX Blue Line Extension Northeast Corridor Light Rail Project (LYNX BLE) project corridor. Water resources information includes physical aspects of the resources, their relationship to major water systems, best usage standards and water quality of the resources. Potential impacts to jurisdictional streams, floodplains and wetlands in the study area for the alternatives under study in this Draft Environmental Impact Statement (EIS) are estimated and summarized. Mitigation is identified as necessary. Additional technical information may be found in the supporting *Natural Resources Technical Report* (July, 2010).

11.1 Affected Environment

Background research on water resources, including streams, wetlands and other area features, as well as field investigations on multiple dates were conducted. The field investigators walked the following locations: the proposed Light Rail Alternative right-of-way, approximately 200 feet wide; the proposed station locations; the proposed park-and-ride facility locations; and the area encompassing the Light Rail Alternative – Sugar Creek Design Option in order to identify the water resources located within the project corridor. The following section summarizes these investigations.

11.1.1 Groundwater

The North Carolina Division of Water Quality (NCDWQ) regulates groundwater by preventing pollution, managing and restoring degraded groundwater and protecting groundwater resources. Groundwater levels and flow in the project vicinity vary widely, largely due to urban development. According to the United States Department of Agriculture/Soil Conservation Service (USDA SCS) Soil Survey of Mecklenburg County, North Carolina, the groundwater levels vary throughout the study area. The highest water tables within the study area are anticipated to be in the areas mapped as Monacan soils in the Little Sugar Creek drainage corridor, the railroad crossing of an unnamed tributary to Little Sugar Creek east of the proposed 36th Street Station and the wetland areas mapped in the Mallard Creek floodplain. Perched water tables associated within the areas mapped as Helena soils may be found in the area of the proposed Sugar Creek Station Park-and-Ride – Sugar Creek Design Option, the proposed Old Concord Road Station park-and-ride lot and along the railroad right-of-way between the proposed Sugar Creek Station and the proposed Old Concord Road Station. A list of public water supply wells and privately-owned wells within the project vicinity and a limited area of the project region was also reviewed. According to the Mecklenburg County Land Use and Environmental Services Agency (LUESA) Groundwater & Wastewater Services, one public water supply groundwater well and ten locations of privately-owned wells lie within approximately 2,000 feet of the LYNX BLE. According to the Charlotte-Mecklenburg Utilities Department (CMU), one well is within the proposed light rail alignment on the University of North Carolina at Charlotte (UNC Charlotte) campus.

11.1.2 Surface Waters

The proposed project corridor is located in two drainage basins, the Catawba and Yadkin River Basins as shown in Figure 11-1. The southern portion of the study area is located within the Lower Catawba watershed of the Catawba River Basin, which is referred to as the Santee River Basin by the USGS. The northern portion of the study area is located within the Rocky River watershed of the Yadkin River Basin, which is referred to as the Upper Pee Dee River Basin by the USGS. Major streams in the southern half of the project region (Upper Little Sugar Creek and Briar Creek in the Catawba River Basin) generally flow in a southerly direction, while streams in the northern half of the project region (Mallard Creek in the Rocky River watershed of the Yadkin River Basin) generally flow in a northeasterly direction.

Surface water features, or drainages, within the project corridor were evaluated to determine the types of streams (i.e., perennial streams, intermittent streams, or ephemeral channels), according to U.S. Army Corps of Engineers (USCOE) and NCDWQ guidelines. Each feature was evaluated as to whether it was defined as a "water of U.S." by the USCOE or whether it was included in the jurisdiction of the NCDWQ. The jurisdictional streams within the study area are listed in Table 11-1 from south to north and shown in Figure 11-2. Stream jurisdictional boundaries, as well as the hydrologic classification were field-verified by the USCOE and NCDWQ on July 21, 2009. Subsequent to this agency field review, the USCOE issued a notification of jurisdictional determination dated October 21, 2009 and an updated notice of determination on December 2, 2009 (Appendix B).

11.1.3 Floodplains and Regulatory Floodways

The Federal Emergency Management Administration (FEMA), in cooperation with federal, state, and local governments, has developed floodway boundaries and Flood Insurance Rate Maps (FIRM) for Mecklenburg County. In Mecklenburg County, this information is available on the Charlotte-Mecklenburg Property Ownership and Land Records Information System (POLARIS website, accessed December, 2008).

Floodplains are land areas adjacent to rivers and streams that are subject to recurring inundation. Owing to their continually changing nature, floodplain areas and other flood-prone areas need to be examined in light of how they might affect or be affected by development. Community Floodplains were established by Mecklenburg County in 2000. Unlike FEMA floodplains that are established by FEMA officials and identify current floodway boundaries, Community Floodplains identify what areas will be prone to flooding in the future, once land upstream is paved and built upon. As such, they are known as the future floodplains or Community Floodplains. The floodplain regulations restrict development from occurring within these areas. Floodplains within the project corridor are shown on Figure 11-3.

Rivers and streams where FEMA has prepared detailed engineering studies may have designated floodways. A floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. For most waterways, the floodway is where the water is likely to be deepest and fastest and is the area of the floodplain that should be reserved (kept free of obstructions) to allow floodwaters to move downstream. Placing fill or buildings in a FEMA Floodway may block the flow of water and increase flood elevations. The Community Encroachment Area is a floodway with a surcharge of 0.1 foot. This creates a wider floodway than the FEMA Floodway. Floodways within the project corridor are shown on Figure 11-3.

According to the FIRM maps for Mecklenburg County, the study area falls outside of the FEMA 100-year floodplain for the proposed Light Rail Alternative alignment, with the exception of proposed crossings of Little Sugar Creek (Stream F), Toby Creek (Stream U), the unnamed tributary to Mallard Creek (Stream T) and Mallard Creek (Stream M), and the encroachment into the floodplain at the proposed 36th Street Station. The Little Sugar Creek Community Floodplain is within the project corridor and extends for approximately 400 feet along the north side of North Brevard Street. The floodplain area along the south side of North Brevard Street extends for approximately 300 feet. An existing bridge on North Brevard Street crosses Little Sugar Creek (Stream F) adjacent to the study area. The Little Sugar Creek floodplain west of 36th Street extends along the project corridor for approximately 500 feet, to the proposed 36th Street Station.

The portion of Toby Creek (Stream U) within the project corridor has a wide Community Floodplain that extends for nearly 1,000 feet along the proposed Light Rail Alternative. The floodplain widths at Toby Creek extend from 600 to 800 feet perpendicular across the channel.

The project corridor crosses an unnamed tributary (Stream T) to Mallard Creek northeast of the UNC Charlotte campus. The Community Floodplain at this location extends for approximately 1,000 feet along the proposed Light Rail Alternative and becomes part of the Mallard Creek floodplain as the alignment turns to cross East Mallard Creek Church Road. The project corridor crosses the Community Floodplain and Community Encroachment Area at the crossing of the unnamed tributary.

Table 11-1
Description of Jurisdictional Streams in the Study Area

Stream Name	Channel Bottom Width[1]	Bank Height[1]	Substrate	Description of Drainage[2]	Hydrology	Area (acres)	Linear Feet
Stream C	8-10 ft.	4-5 ft.	Sand, silt, cobble, rock	Crosses under railroad right-of-way. Low flow with depths less than 3”.	Perennial	0.14	306
Stream D	3-4 ft.	5-6 ft.	Sand, silt, cobble, rock	Tributary to Stream C. Parallels railroad right-of-way. Low flow with depths less than 3”.	Intermittent	0.14	396
Stream F (Little Sugar Creek)	20-22 ft.	10-14 ft.	Sand , silt, rock, boulders	Crosses under North Brevard Street. High flow observed with depths greater than 14”. Fish observed.	Perennial	0.31	662
Stream J	4-6 ft.	4-6 ft.	Sand, silt, gravel, rock	Exposed portion from East 30th Street culvert discharge. Low flow with depths less than 6”.	Perennial	0.03	103
Stream K	4-6 ft.	4-6 ft.	Sand, silt, gravel	Exposed portion from Stream J culvert. Low flow with depths less than 4”.	Perennial	0.03	192
Stream N	8-10 ft.	1-2 ft.	Sand, silt	Exposed portions of stormwater drainage to Linear Wetland Y. Headwater pond over 1’ deep. No flow in channel.	Intermittent	0.02	77
Stream A	6-16 ft.	6-10 ft.	Sand, silt, cobble, rock	Crosses under and parallels railroad right-of-way and North Davidson Street. Low flow with depths less than 6”.	Perennial/ Intermittent	0.108	1,009
Stream B	4-5 ft.	5-6 ft.	Sand, silt	Parallels east side of railroad right-of-way north of Bearwood Avenue. Low flow with depths less than 4”.	Intermittent	0.013	122
Stream P	4-5 ft.	2-3 ft.	Sand, silt, rock	Two branches parallel west side of railroad right-of-way. Low flow with depths less than 4”.	Intermittent	0.15	1,638
Stream S	6-8 ft.	3-5 ft.	Sand, silt, cobble, rock	Exposed portion in the middle of proposed Sugar Creek Station park-and-ride lot. Low flow depths less than 4”.	Perennial	0.05	355
Stream Z	4-5 ft.	3-4 ft.	Sand, silt, cobble, rock	Two non-jurisdictional ephemeral branches on west side of railroad right-of-way drain to culvert and create intermittent stream on east side. Low flow with depths less than 6”.	Intermittent	0.01	84
Stream E	4-8 ft.	6-10 ft.	Sand, silt, gravel	Crosses under railroad right-of-way at the proposed Old Concord Road Station park-and-ride lot. Has two non-jurisdictional ephemeral tributaries at park-and-ride site. Low flow with depths less than 4”.	Intermittent	0.09	577
Stream X	2-4 ft.	4-6 ft.	Sand, silt	Located at the proposed University City Blvd. Station park-and-ride lot. Drains through Wetland X. Low flow with depths less than 2”.	Intermittent	0.04	622
Stream U (Toby Creek)	20-25 ft.	8-10 ft.	Sand, silt, cobble, rock	Located on the UNC Charlotte campus. High flow observed with depths greater than 24”. Fish observed.	Perennial	0.43	768
Stream T	10-12 ft.	1-2 ft.	Sand, silt, cobble, rock	Located on the UNC Charlotte campus. Moderate flow observed with depths greater than 6”.	Perennial	0.22	890
Stream M (Mallard Creek)	20-25 ft.	12-15 ft.	Sand , silt, rock, boulders	Located north of the proposed Mallard Creek Church Station park-and-ride lot. High flow observed with depths greater than 6”. Fish observed.	Perennial	0.42	548
Stream Q	12-14 ft.	1-2 ft.	Sand, silt, gravel	Located at the proposed I-485/N. Tryon Station from Wetland Q culvert discharge. Low flow. Fish observed.	Perennial	0.04	296
					TOTALS:	**2.241**	**8,645**

[1] - All stream dimensions are approximate
[2] - Descriptions based on field surveys conducted between September 2, 2008 and November 5, 2009.

At Mallard Creek (Stream M), the Community Floodplain is approximately 900 feet wide and extends into a portion of the I-485/N. Tryon Station. The project corridor crosses approximately 600 feet of the Community Encroachment Area at the crossing of Mallard Creek.

11.1.4 Wetlands

Surveys of the proposed project study area, including the proposed stations and park-and-ride facility locations, were conducted from September 2008 through November 2009. Potential wetland communities were first identified by reviewing National Wetlands Inventory maps and hydric soil lists for the study area and then conducting field visits to verify the presence/absence of a wetland. Jurisdictional wetlands are defined in the field as areas that exhibit positive evidence of three environmental parameters: hydrophytic vegetation, wetland hydrology and hydric soils. Boundaries of the wetlands were determined through observations of vegetation and surficial hydrology, as well as soil samples. Soil samples were taken where hydrology and vegetation indicated the potential presence of a wetland. Soil samples were evaluated using a shovel to a depth of approximately 16 inches. Soils were compared to a Munsell Color chart (1994) to evaluate chroma values and to note the presence of mottling and oxidized root channels, which indicate the presence of hydric soils.

The results of the on-site field review conducted by environmental scientists indicate that there are 13 jurisdictional wetland areas located within the study area, as shown in Figure 11-2. Table 11-2 summarizes the wetlands and the area and linear feet of linear wetlands that are located within the study area. These jurisdictional wetland boundaries were delineated, flagged in the field and the boundaries were surveyed. All jurisdictional wetland area boundaries have been verified by the USCOE and a Notification of Determination was issued on October 21, 2009 and updated on December 2, 2009.

Table 11-2
Jurisdictional Wetlands Located Within the Study Area

Wetland Label	Special Form[1]	Wetland Type	Description of Drainage	Area (acres)	Linear Feet
C	Linear	Emergent	Swale that discharges stormwater from East 16th Street	0.02	296
Y	Linear	Forested	Swale behind RR and commercial building	0.14	527
A	Linear	Forested	Swale behind RR and commercial building	0.012	265
A		Scrub-Shrub/ Emergent	Created as a result of grading for a drainage improvement project	0.22	n/a
P	Isolated	Open Water/ Emergent	In the backyard of a residence, appears to have subsurface connection to Stream P	0.02	n/a
O	Isolated	Forested	Former detention basin	0.16	n/a
E		Forested	Drains directly into Stream E	0.06	n/a
X		Forested	Downstream of Stream X, ends at a recently built headwall and pipe culvert	0.36	n/a
R	Isolated	Forested	A running trail created a berm that impedes drainage and created the wetland	0.07	n/a
T		Forested	Stormwater and flooding of Stream T contribute to the hydrology	3.39	n/a
W		Forested	Stormwater and flooding of Stream T contribute to the hydrology	1.19	n/a
N		Forested	Created to provide mitigation for NCDOT, part of County's Mallard Creek Park	1.25	n/a
Q	Linear	Forested	Swale from a pipe culvert under North Tryon Street/US-29	0.03	125
			TOTALS:	**6.922**	**1,213**

Based on field delineations and GPS surveys conducted between September 2, 2008 and November 5, 2009.
[1]Isolated wetlands considered non-jurisdictional by USCOE but may be regulated by NCDWQ.

11.2 Environmental Consequences

Anticipated impacts to water resources, notably jurisdictional streams and wetlands as well as regulated floodplain areas are described in the following sections. The impacts to streams, floodplains and wetlands by alternative are summarized in Tables 11-3, 11-4 and 11-5, respectively.

11.2.1 No-Build Alternative

Under the No-Build Alternative, no construction would take place; therefore, no impacts to the water resources in the project corridor would result.

11.2.2 Light Rail Alternative

Preliminary impact estimates to the jurisdictional features for the proposed Light Rail Alternative are based on design assumptions as shown in the *30% Preliminary Engineering Design Plans* completed March 2010. Preliminary cut and fill limits were placed as an overlay on the GPS survey of the jurisdictional stream and wetland features to estimate the impacts identified. In many instances the impacts are less than the total area studied. Estimated impacts are subject to refinement based on the continuance of the design and further development of the engineering plans. The current level of design estimates the final construction limits. Final construction limits as well as temporary construction easements, staging areas, etc., will be addressed and refined in further stages of design.

11.2.2.1 Groundwater

Two project components that would require excavation include the depression of 36th Street beneath the light rail and freight tracks and carrying of the light rail below North Tryon Street/US-29 onto the UNC Charlotte campus. There are no wells within the vicinity of the proposed project at 36th Street; therefore, no groundwater impacts would be anticipated as a result of excavation. The well located on the UNC Charlotte campus within the proposed project alignment is no longer in use. CATS and/or UNC Charlotte will complete the abandonment/closure process per North Carolina Department of Environment and Natural Resources (NCDENR) requirements prior to construction of the project. It is anticipated that the well will be filled and sealed and the outer well casing will be grouted to a minimum depth of 20 feet or removed, per state regulations. It is anticipated that groundwater would therefore not be impacted by the proposed project. The next closest public water supply well to the project corridor is more than 1,500 feet away. As such, no other groundwater impacts would be anticipated. The 10 privately-owned wells that are within 2,000 feet of the project corridor would not be affected by the operation of the light rail vehicles because the vehicles do not have gasoline or oils that could spill and contaminate the groundwater. Additionally, each station location and park-and-ride facility would implement best management practices (BMPs) for the collection and treatment of stormwater runoff.

11.2.2.2 Surface Waters

Table 11-3 identifies the impacts to streams that would result from the proposed Light Rail Alternative. With the exception of Streams F, B, E, X, U and M, the remaining jurisdictional streams in the study area would be disturbed by the proposed Light Rail Alternative. Linear Wetland Y, Linear Wetland A, Wetland A, Isolated Wetland P, Wetland E, Isolated Wetland R, Wetland T, Wetland W and Linear Wetland Q would also be disturbed by the proposed Light Rail Alternative. A total of 3,262 linear feet of streams (23,256 square feet) would be relocated, have bridge structures placed within or would be piped.

Stream C is a perennial unnamed tributary to Little Sugar Creek (Stream F) located in the Little Sugar Creek Watershed, Catawba River Basin. Based on *30% Preliminary Engineering Design Plans*, it is anticipated that approximately 30 linear feet of Stream C would need to be piped, extending from the existing pipe culvert, in order to widen the railroad right-of-way embankment for the proposed alignment. Additionally, a riprap apron approximately 60 feet in length would be placed in Stream C at the discharge point for the extended pipe resulting in 90 linear feet of disturbance to Stream C.

Stream D is an intermittent jurisdictional unnamed tributary to Stream C located in the Little Sugar Creek Watershed, Catawba River Basin. Approximately all 396 linear feet of Stream D would be filled and the drainage relocated to the toe of the embankment created for the proposed alignment.

Stream F is a perennial stream (Little Sugar Creek) located in the Little Sugar Creek Watershed, Catawba River Basin. Stream F flows from north to south, across the proposed alignment and under North Brevard Street. Stream F would be bridged for the LYNX BLE and no direct impacts to Stream F would result. However, due to the proximity of the stream to the estimated final construction limits, this area will be evaluated in further stages of design for impacts due to temporary construction activities.

Stream J is a perennial unnamed tributary to Little Sugar Creek (Stream F) located in the Little Sugar Creek Watershed, Catawba River Basin. Approximately all 103 linear feet of Stream J would be filled for the construction of a new access to the Duke Energy substation.

Stream K is a perennial, unnamed tributary to Stream F located in the Little Sugar Creek Watershed, Catawba River Basin. Pipe replacement and the subsequent addition of a riprap apron would disturb approximately 54 linear feet of Stream K.

Stream N is an intermittent stormwater drainage feature located in the Little Sugar Creek Watershed, Catawba River Basin. Approximately all 77 linear feet of Stream N would be filled by the embankment created for the proposed alignment.

Stream A is a perennial/intermittent unnamed tributary to Little Sugar Creek (Stream F) located in the Little Sugar Creek Watershed, Catawba River Basin. Approximately 111 linear feet of the perennial portion of Stream A would be piped or channelized by the embankment created for the relocated freight tracks associated with the proposed light rail alignment. Intermittent Stream A is an unnamed tributary to perennial Stream A located parallel to North Davidson Street in the Little Sugar Creek Watershed, Catawba River Basin. Approximately all 791 linear feet of the intermittent portion of Stream A would be disturbed by piping.

Stream P is an intermittent channel located in the Little Sugar Creek Watershed, Catawba River Basin. Approximately 1,280 linear feet of Stream P would be disturbed by piping.

Stream Z is an intermittent, unnamed tributary to Briar Creek located in the Briar Creek Watershed, Catawba River Basin. Pipe replacement and the subsequent addition of a riprap apron will create fill impacts to Stream Z totaling approximately 44 linear feet.

Stream E is an intermittent unnamed tributary to Briar Creek located in the Briar Creek Watershed, Catawba River Basin. Impacts to Stream E would be avoided by the proposed Old Concord Road Station park-and-ride lot that would be constructed for the proposed LYNX BLE Project. However, due to the proximity of the stream to the estimated final construction limits, this area will be evaluated in further stages of design for impacts due to temporary construction activities.

Stream X is an intermittent unnamed tributary to Doby Creek located in the Mallard Creek Watershed, Yadkin-Pee Dee River Basin. Impacts to Stream X would be avoided by the proposed University City Blvd. Station park-and-ride lot that would be constructed for the proposed LYNX BLE Project. However, due to the proximity of the stream to the estimated final construction limits, this area will be evaluated in further stages of design for impacts due to temporary construction activities.

Stream T is a perennial tributary to Mallard Creek (Stream M) located in the Mallard Creek Watershed, Yadkin River Basin. Approximately 176 linear feet of Stream T would be piped for the proposed LYNX BLE Project.

Stream Q is a perennial unnamed tributary to Mallard Creek (Stream M) located in the Mallard Creek Watershed, Yadkin-Pee Dee River Basin. Approximately 140 linear feet of Stream Q would be disturbed by fill and the proposed stormwater outfall at the proposed I-485/N. Tryon Street Station park-and-ride garage.

Table 11-3
Summary of Estimated Stream Impacts

Jurisdictional Area	Type of Jurisdictional Area	Permanent Impact (Y/N)	No-Build Alternative	Light Rail Alternative		Light Rail Alternative – Sugar Creek Design Option	
				Length of Impact (lf)	Area of Impact (ft^2)	Length of Impact (lf)	Area of Impact (ft^2)
Stream C	Perennial	Yes	0	90	2,361	90	2,361
Stream D	Intermittent	Yes	0	396	5,972	396	5,972
Stream F	Perennial	No Impact	0	0	0	0	0
Stream J	Perennial	Yes	0	103	1,356	103	1,356
Stream K	Perennial	Yes	0	54	327	54	327
Stream N	Intermittent	Yes	0	77	849	77	849
Stream A	Perennial	Yes	0	111	2,486	111	2,486
Stream A	Intermittent	Yes	0	791	791	791	791
Stream B	Intermittent	No Impact	0	0	0	0	0
Stream P	Intermittent	Yes	0	1,280	5,760	0	0
Stream S	Perennial	Yes	0	0	0	211	1,414
Stream Z	Intermittent	Yes	0	44	311	0	0
Stream E	Intermittent	No Impact	0	0	0	0	0
Stream X	Intermittent	No Impact	0	0	0	0	0
Stream U	Perennial	No Impact	0	0	0	0	0
Stream T	Perennial	Yes	0	176	1,936	176	1,936
Stream M	Perennial	No Impact	0	0	0	0	0
Stream Q	Perennial	Yes	0	140	1,107	140	1,107
		TOTALS:	**0**	**3,262**	**23,256**	**2,149**	**18,599**

The Light Rail Alternative is based on *30% Preliminary Engineering Design Plans* (March, 2010) and field survey data.
The Light Rail Alternative – Sugar Creek Design Option is based on *15% Preliminary Engineering Design Plans* (January 2009) and field survey data.

11.2.2.3 Floodplains and Regulatory Floodways

Table 11-4 provides estimates of impacts, based on *30% Preliminary Engineering Design Plans*, to Community Floodplains, Community Encroachment Areas, and FEMA Floodways for the proposed Light Rail Alternative, and the Light Rail Alternative – Sugar Creek Design Option. Figure 11-3 shows the locations where the proposed Light Rail Alternative would encroach into the floodplain. All totaled, the proposed Light Rail Alternative would result in estimated impacts of 8.47 acres (368,812 square feet) in Community Floodplains, 0.87 acre (37,746 square feet) in Community Encroachment Areas and 0.2 acre (8,902 square feet) in FEMA Floodways.

It is anticipated the bridge crossing of Little Sugar Creek adjacent to North Brevard Street would require the construction of two bridge end bents and two center bents. The two end bents would not impact any regulatory floodways. The two center bents would be composed of two columns each, each column with a drilled shaft, for a total of four drilled shafts within the Community Floodplain and Community Encroachment Area. Approximately 17 square feet of Community Floodplain and 46 square feet of Community Encroachment Area may be affected by the two center bents. The two end bents would impact approximately 30 square feet of Community Encroachment Area and 4,090 square feet of Community Floodplains. A total of 76 square feet of Community Encroachment Area and 4,107 square feet of Community Floodplain would be affected at this location.

A portion of the proposed access drive and the drainage associated with the Duke Energy substation would encroach upon the Little Sugar Creek Community Floodplain. The extent of the impact to the Community Floodplain of Little Sugar Creek at the Duke Energy substation access drive would be approximately 2,611 square feet.

The relocation of the freight tracks behind the Cullman Avenue industrial facilities would encroach upon a portion of the Little Sugar Creek Community Floodplain. The relocation of the freight tracks would affect approximately 1.19 acres (51,791 square feet) of the Community Floodplain of Little Sugar Creek at this location.

The portion of Toby Creek (Stream U) within the project corridor has a wide Community Floodplain Area that extends for nearly 1,000 feet. The proposed bridge crossing of Toby Creek would require two bridge end bents armored with riprap and eleven interior bents. Each of the 11 center bents would be supported by three columns, each column with a five foot diameter drilled shaft. This would result in six interior bents (18 drilled shafts) within the FEMA Floodway, two interior bents (six drilled shafts) within the Community Encroachment Area and three interior bents (nine drilled shafts) within the Community Floodplain. One proposed end bent with riprap is wholly within the Community Encroachment Area, and one proposed end bent with riprap is partially within the Community Floodplain. A total of 352 square feet of FEMA Floodway, 11,540 square feet of Community Encroachment Area and 39,696 square feet of Community Floodplain would be affected at this location.

The proposed project corridor crosses an unnamed tributary to Mallard Creek (Stream T) as it leaves the UNC Charlotte campus. The Community Floodplain at this location extends for approximately 1,000 feet and becomes part of the Mallard Creek floodplain as the alignment turns to cross East Mallard Creek Church Road. A portion of the Community Encroachment Area and the Community Floodplain would be disturbed at the crossing of this unnamed tributary. Approximately 1.95 acres (84,735 square feet) of Community Floodplain and 0.24 acre (10,244 square feet) of Community Encroachment Area may be affected at this location.

The crossing of Mallard Creek Church Road would require improvements to East Mallard Creek Church Road within the FEMA Floodway, Community Encroachment Area and Community Floodplain of Mallard Creek. A portion of the Mallard Creek Church Station park-and-ride lot would be built within the Community Floodplain of Mallard Creek. A total of 8,400 square feet of FEMA Floodway, 7,918 square feet of Community Encroachment Area and 2.41 acres (104,973 square feet) of Community Floodplain would be affected at this location.

At the Mallard Creek (Stream M) crossing, the floodplain is approximately 900 feet wide. The bridge crossing of Mallard Creek would require two bridge end bents armored with riprap and seven interior

bents. Each of the interior bents would be supported by two columns, each column with a five foot diameter drilled shaft. This results in six interior bents (12 drilled shafts) within the FEMA Floodway, one interior bent (two drilled shafts) and one partial end bent with riprap within the Community Encroachment Area. The remainder of that end bent with riprap and the whole of the other end bent with riprap is within the Community Floodplain. A total of 150 square feet of FEMA Floodway, 7,968 square feet of Community Encroachment Area and 1.28 acres (55,823 square feet) of Community Floodplain would be affected at this location.

A portion of the I-485/N. Tryon Station park-and-ride garage is located in the Mallard Creek (Stream M) Community Floodplain. Approximately 0.58 acre (25,076 square feet) of Community Floodplain would be affected by the garage and the proposed stormwater outfall at this location.

Table 11-4
Summary of Estimated Floodplain Impacts

Location	Type of Potential Jurisdictional Area	Permanent Impact (Y/N)	No-Build Alternative	Light Rail Alternative Area of Impact (ft^2)	Light Rail Alternative – Sugar Creek Design Option Area of Impact (ft^2)
Little Sugar Creek (Stream F)	Community Floodplain	Yes	0	4,107	4,107
Little Sugar Creek (Stream F)	Community Encroachment Area	Yes	0	76	76
Duke Energy Access Drive	Community Floodplain	Yes	0	2,611	2,611
36th Street Station/ Cullman Avenue Area	Community Floodplain	Yes	0	51,791	51,791
Toby Creek (Stream U)	Community Floodplain	Yes	0	39,696	39,696
Toby Creek (Stream U)	Community Encroachment Area	Yes	0	11,540	11,540
Toby Creek (Stream U)	FEMA Floodway	Yes	0	352	352
Stream T	Community Floodplain	Yes	0	84,735	84,735
Stream T	Community Encroachment Area	Yes	0	10,244	10,244
Mallard Creek Church Road and Station	Community Floodplain	Yes	0	104,973	104,973
Mallard Creek Church Road and Station	Community Encroachment Area	Yes	0	7,918	7,918
Mallard Creek Church Road and Station	FEMA Floodway	Yes	0	8,400	8,400
Mallard Creek (Stream M)	Community Floodplain	Yes	0	55,823	55,823
Mallard Creek (Stream M)	Community Encroachment Area	Yes	0	7,968	7,968
Mallard Creek (Stream M)	FEMA Floodway	Yes	0	150	150
I-485/N. Tryon Street Station	Community Floodplain	Yes	0	25,076	25,076
		TOTALS:			
		Community Floodplain:	**0**	**368,812**	**368,812**
		Community Encroachment Area:	**0**	**37,746**	**37,746**
		FEMA Floodway:	**0**	**8,902**	**8,902**

The Light Rail Alternative is based on *30% Preliminary Engineering Design Plans* (March, 2010).
The Light Rail Alternative – Sugar Creek Design Option is based on *15% Preliminary Engineering Design Plans* (January 2009).

11.2.2.4 Wetlands

Table 11-5 provides estimates of impacts to jurisdictional wetlands for the proposed Light Rail Alternative. Linear Wetland Y, Linear Wetland A, Wetland A, Isolated Wetland P, Wetland E, Isolated Wetland R, Wetland T, Wetland W and Linear Wetland Q would be affected by the proposed Light Rail Alternative. All totaled, the proposed Light Rail Alternative would fill and/or cause disturbance to an estimated 1.522 acres of wetlands. No impacts would result to Linear Wetland C, Isolated Wetland O, Wetland X or Wetland N.

Linear Wetland Y (approximately 0.14 acre, 527 linear feet), is a small, linear palustrine forested wetland located north of the railroad right-of-way and west of 36th Street. Approximately all 0.14 acre of Linear Wetland Y would be filled by the construction of an embankment and a retaining wall for the planned relocation of the existing freight tracks.

Linear Wetland A (approximately 0.012 acre, 265 linear feet) is a small, linear palustrine forested wetland located north of the railroad right-of-way and west of Craighead Road. It is anticipated that all 0.012 acre of Linear Wetland A would be filled by the planned relocation of the existing freight tracks.

Wetland A (approximately 0.22 acre) is a small palustrine scrub-shrub/emergent wetland located on either side of intermittent Stream A, located north of North Davidson Street. It is anticipated that all 0.22 acre of Wetland A would be filled by the construction of a retaining wall and the backfill to raise the alignment to the planned elevation.

Isolated Wetland P (approximately 0.02 acre) is a small, isolated, palustrine open water/emergent wetland located adjacent to and west of the railroad right-of-way in the backyard of a residential dwelling located at the end of Leafmore Drive. It is anticipated that all 0.02 acre of Isolated Wetland P would be filled by the proposed project.

Wetland E (approximately 0.06 acre) is a small, palustrine forested wetland, located at the proposed Old Concord Road Station proposed park-and-ride lot. It is anticipated that the proposed Old Concord Road station park-and-ride lot may impact nearly all 0.06 acre of Wetland E.

Isolated Wetland R (approximately 0.07 acre) is a small, isolated, palustrine forested wetland located on the UNC Charlotte campus, west of the proposed UNC Charlotte Station and east of Toby Creek. It is anticipated that approximately 0.04 acre of Isolated Wetland R would be filled by the proposed project.

Wetland T (approximately 3.39 acres) is the largest of the palustrine forested wetlands mapped in the study area and is located on the UNC Charlotte campus within the western floodplain of the unnamed tributary (Stream T) to Mallard Creek. Approximately 0.80 acre of Wetland T would be filled in order to raise the alignment to the proposed elevation.

Wetland W (approximately 1.19 acres) is a palustrine forested wetland located within the eastern floodplain of the unnamed tributary (Stream T) to Mallard Creek. Approximately 0.20 acre of Wetland W would be filled in order to raise the alignment to the proposed elevation.

Linear Wetland Q (approximately 0.03 acre, 125 linear feet), is a small, linear palustrine forested wetland located at the proposed I-485/N. Tryon Station park-and-ride garage. It is anticipated that all 0.03 acre of Linear Wetland Q would be filled by the construction of the garage.

Table 11-5
Summary of Estimated Wetland Impacts

Jurisdictional Area	Type of Jurisdictional Area	Permanent Impact (Y/N)	No-Build Alternative	Light Rail Alternative Area of Impact (acres)	Light Rail Alternative – Sugar Creek Design Option Area of Impact (acres)
Linear Wetland C	Emergent Wetland	No Impact	0	0	0
Linear Wetland Y	Forested Wetland	Yes	0	0.14	0.14
Linear Wetland A	Forested Wetland	Yes	0	0.012	0.012
Wetland A	Scrub-Shrub/ Emergent Wetland	Yes	0	0.22	0.22
Isolated Wetland P	Emergent/ Open Water Wetland	Yes	0	0.02	0
Isolated Wetland O	Forested Wetland	No Impact	0	0	0
Wetland E	Forested Wetland	Yes	0	0.06	0
Wetland X	Forested Wetland	No Impact	0	0	0
Isolated Wetland R	Forested Wetland	Yes	0	0.04	0.04
Wetland T	Forested Wetland	Yes	0	0.80	0.80
Wetland W	Forested Wetland	Yes	0	0.20	0.20
Wetland N	Forested Wetland	No Impact	0	0	0
Wetland Q	Forested Wetland	Yes	0	0.03	0.03
		TOTALS:	**0**	**1.522**	**1.442**

The Light Rail Alternative is based on *30% Preliminary Engineering Design Plans* (March, 2010) and field survey data.
The Light Rail Alternative – Sugar Creek Design Option is based on *15% Preliminary Engineering Design Plans* (January 2009) and field survey data.

11.2.3 Light Rail Alternative – Sugar Creek Design Option

Stream S is a perennial, unnamed tributary to Little Sugar Creek (Stream F) located in the Little Sugar Creek Watershed, Catawba River Basin. It is anticipated that approximately 211 linear feet of Stream S would need to be piped for the proposed Sugar Creek Station Light Rail Alternative – Sugar Creek Design Option park-and-ride lot for the proposed LYNX BLE Project. However, as indicated on Table 11-3, the Light Rail Alternative – Sugar Creek Design Option would avoid impacts to Stream P and Stream Z (totaling 1,324 linear feet) for an incremental net impact avoidance of 1,113 linear feet (4,657 square feet) of stream impacts compared to the proposed Light Rail Alternative. A total of 2,149 linear feet of streams (18,599 square feet) would be relocated, have bridge structures placed within or would be piped for the Light Rail Alternative – Sugar Creek Design Option.

As indicated on Table 11-4, the Sugar Creek Design Option would result in no change in the estimated impacts to the Community Floodplains, Community Encroachment Areas and the FEMA Floodways as calculated for the proposed Light Rail Alternative. The proposed Light Rail Alternative – Sugar Creek Design Option would result in estimated impacts of 8.47 acres (368,812 square feet) in Community Floodplains, 0.87 acre (37,746 square feet) in Community Encroachment Areas and 0.2 acre (8,902 square feet) in FEMA Floodways.

As summarized in Table 11-5, the proposed Light Rail Alternative – Sugar Creek Design Option would avoid impacts to Isolated Wetland P (0.02 acre) and Wetland E (0.06 acre) for an incremental net impact avoidance of 0.08 acre of wetlands when compared with the proposed Light Rail Alternative. The proposed Light Rail Alternative – Sugar Creek Design Option would fill and/or cause disturbance to an estimated 1.442 acres of wetlands.

11.3 Mitigation

This section describes measures that will be used to reduce the adverse impacts to water resources, as well as mitigation that may be required for groundwater, surface waters, floodplains and regulatory floodways and wetland impacts.

11.3.1 Light Rail Alternative

Water resources within the study area intersect the project corridor, thereby making impacts to waters of the U.S. and floodplains as a result of the proposed Light Rail Alternative largely unavoidable. Efforts to minimize the potential impacts to water resources were incorporated during the preliminary design phase. Specific mitigation measures that will be implemented to compensate for unavoidable impacts will be refined and presented in the Final EIS. The following sections describe the mitigation currently identified for the groundwater, surface water, floodplain and wetland resource impacts described in this Chapter.

As a result of the identified impacts, it is anticipated that a Section 404 permit application will be required. The permit application must be completed during final design before construction activities may commence. This permit will require the discussion of the measures employed throughout planning and design in order to avoid/minimize impacts to waters of the U.S. The 404 permit application must also include a compensatory mitigation proposal, which outlines the plan to provide compensation to offset permanent losses of waters of the U.S.

11.3.1.1 Groundwater

Efforts will be implemented to reduce the effects of the proposed Light Rail Alternative on groundwater resources. The North Carolina Erosion and Sediment Control Planning and Design Manual (1988 - updated June 2006), the City of Charlotte Land Development Standards Manual Series 3000 and the North Carolina Department of Transportation design specifications will be used to minimize the impacts to terrestrial and aquatic habitats. These sediment and erosion control measures will help to protect aquatic resources that may contribute to groundwater recharge within the study area. As noted in Section 11.2.2.1, CATS and/or UNC Charlotte will complete the abandonment/closure process to seal the existing out-of-service well located within the proposed alignment on the UNC Charlotte campus.

11.3.1.2 Surface Water

The proposed Light Rail Alternative would affect approximately 3,262 linear feet of streams based on the *30% Preliminary Engineering Design Plans* (March 2010). Additional efforts to minimize impacts to streams will be considered during future design efforts. Efforts will be made to minimize the use of riprap at pipe inlets and outfalls, relocate channels using natural channel design techniques, when practicable, and minimize impacts to streambanks at proposed bridge locations.

Where avoidance or minimization is not feasible or practicable, compensatory mitigation will be considered. Compensatory mitigation consists usually of the restoration of existing degraded wetlands or waters, or the creation of waters of the U.S. of equal or greater value than the waters to be disturbed. This type of mitigation is only undertaken after avoidance and minimization actions are exhausted and should be undertaken, when practicable, in areas near the impact site (i.e., on-site compensatory mitigation).

It is anticipated that the Charlotte Umbrella Stream and Wetland Mitigation Bank (Umbrella Bank) may be utilized to provide mitigation to satisfy the federal Clean Water Act compensatory mitigation requirements. In the event the purchase of available credits from the Umbrella Bank do not satisfy the project's mitigation requirements, then, in accordance with the "Memorandum of Agreement Among the North Carolina Department of Environment and Natural Resources, the North Carolina Department of Transportation, and the U.S. Army Corps of Engineers, Wilmington District" (MOA), July 22, 2003, the NCDENR Ecosystem Enhancement Program (EEP) may also be requested to provide mitigation via purchase of in-lieu fee credits. A final determination regarding mitigation for impacts to waters of the U.S. rests with the USCOE and NCDWQ and compensatory mitigation for impacts will be resolved during the permitting phase of the project. In the case of public transportation projects, the mitigation plan must be implemented before the proposed project is open to the traveling public.

11.3.1.3 Floodplains and Regulatory Floodways

Hydraulic studies will be performed prior to completion of the 65 percent design stage. If hydraulic studies determine that the proposed Light Rail Alternative would cause an increase in the 100-year flood

elevation, the following applies: 1) any increase greater than 0.00 feet will require a Conditional Letter of Map Revision (CLOMR), 2) a CLOMR will not be issued for the project if the proposed increase (greater than 0.00 feet) impacts an existing habitable structure, 3) for development outside of the FEMA floodway, but within the Community Encroachment Area, an increase in base flood elevation of up to 0.10 feet is permissible without obtaining a Community Letter of Map Revision (CoLOMR) if no habitable structures are impacted, and 4) a CoLOMR is required for increases within the Community Encroachment Area greater than 0.10 feet. CATS may make floodplain modifications to decrease the 100-year flood elevation to within 0.1 feet to avoid purchasing property. If the preferred alternative involves significant encroachment of the floodplain, the final environmental document must include: 1) Federal Transit Administration's finding that the proposed action is the only practicable alternative, 2) supporting documentation reflecting consideration of alternatives to avoid/reduce adverse impacts on the floodplain.

The 30 percent design plans call for bridging over three perennial streams, Little Sugar Creek (Stream F), Toby Creek (Stream U) and Mallard Creek (Stream M), in an effort to minimize impacts to Community Floodplains, Community Encroachment Areas and the FEMA Floodways. These bridges will be designed to minimize impacts to floodplains and regulatory floodways.

Charlotte Stormwater Services reviewed the *15% Preliminary Engineering Design Plans* dated January 6 and January 20, 2009 and requested that the project engineers work with Charlotte and County Stormwater Services make sure the proposed work does not significantly affect FEMA Floodways, Community Floodplains and Community Encroachment Areas and that the appropriate approvals and permits are obtained. Charlotte Stormwater Services will also review the *30% Preliminary Engineering Design Plans* to ensure the proposed LYNX BLE project's compliance with floodway and floodplain regulations.

11.3.1.4 Wetlands

The proposed Light Rail Alternative would affect approximately 1.522 acres of wetlands. Three general types of wetland mitigation include avoidance, minimization and compensatory mitigation. Additional efforts to avoid and minimize impacts to wetlands will be considered during continued preliminary engineering design efforts. Efforts to minimize potential impacts to wetlands may include the following: steepening fill slopes where practicable; use of retaining walls or similar structures; locating construction staging areas away from wetlands; and demarcating preserved wetland areas prior to construction.

The Charlotte Umbrella Bank may be utilized to provide mitigation to satisfy the federal Clean Water Act compensatory mitigation requirements for this project in the event on-site mitigation is not feasible and/or practicable. If the purchase of available credits from the Umbrella Bank would not satisfy the project's mitigation requirements, then, EEP may also be requested to provide mitigation via purchase of in-lieu fee credits. A final determination regarding mitigation for impacts to waters of the U.S. rests with the USCOE and NCDWQ and compensatory mitigation for impacts would be resolved during the permitting phase of the proposed Light Rail Alternative.

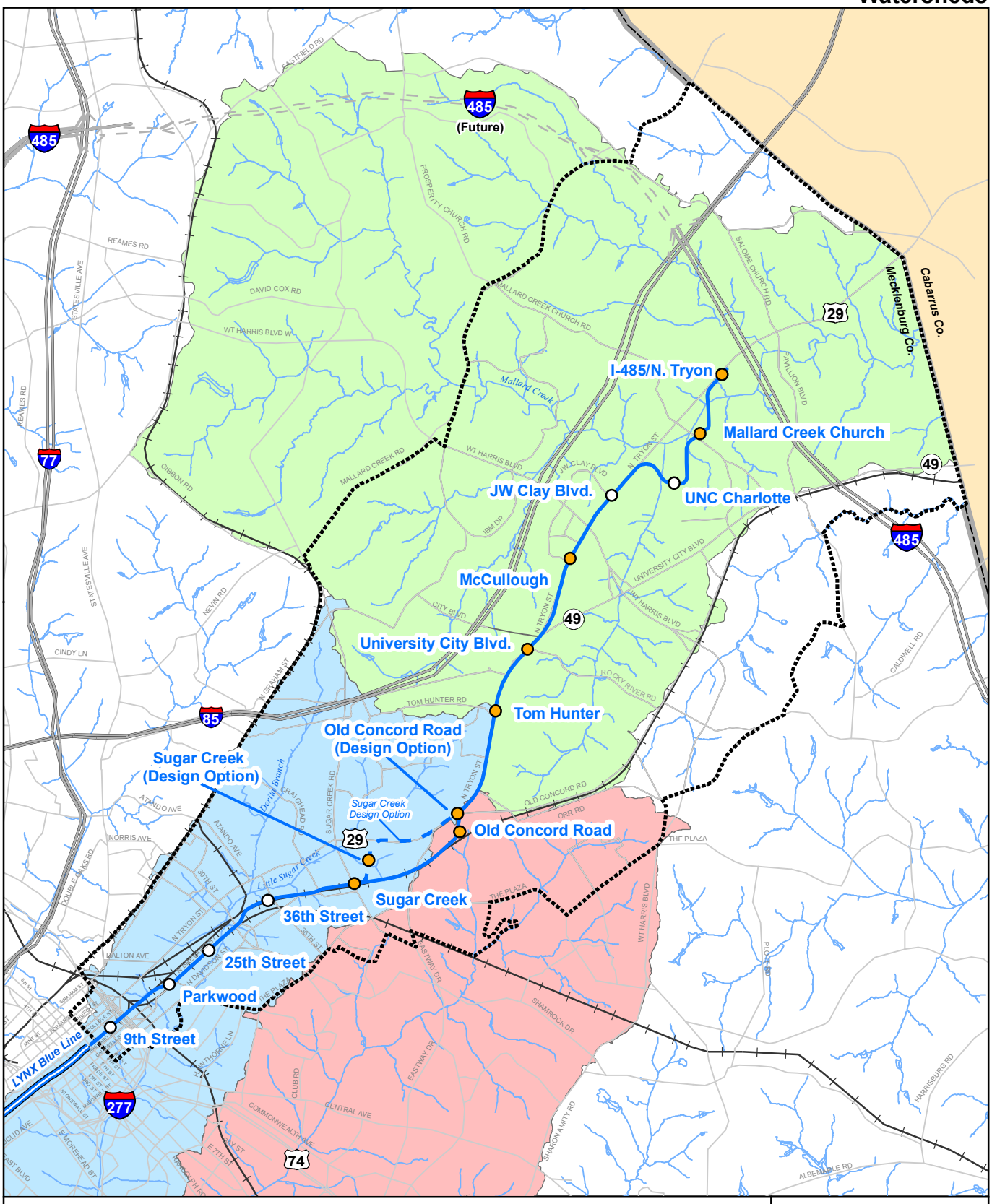
Specific mitigation for Wetland N, an NCDOT mitigation site that exists within Kirk Farm Fields park adjacent to the proposed Mallard Creek Church Station, will include the continued avoidance of this wetland in the preliminary engineering and final design plans. Proposed development at this location will be directed to the south side of Wetland N and retaining walls would be employed north of the proposed Mallard Creek Church Station to avoid possible additional impacts. Similar avoidance and minimization strategies will be utilized in other segments of the project where feasible and practicable.

11.3.2 Light Rail Alternative – Sugar Creek Design Option

The Light Rail Alternative – Sugar Creek Design Option would not require any additional mitigation over the proposed Light Rail Alternative. The water resource impacts of this design option would be fewer than with the proposed Light Rail Alternative. If selected for implementation, the same mitigation outlined in Section 11.3.1 will be undertaken for the Light Rail Alternative – Sugar Creek Design Option.

LYNX Blue Line Extension

Figure 11-1
Watersheds



Legend

- Northeast Corridor Limits
- Light Rail Transit
- Design Option
- Proposed Stations
- Proposed Stations with Park-and-Ride
- LYNX Existing Light Rail Transit
- Highway
- Major Roads
- Highway (Future)
- Streams
- Railroads
- County Line
- Mallard Creek Watershed, Yadkin River Basin
- Briar Creek Watershed, Catawba River Basin
- Upper Little Sugar Creek Watershed, Catawba River Basin

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Mile

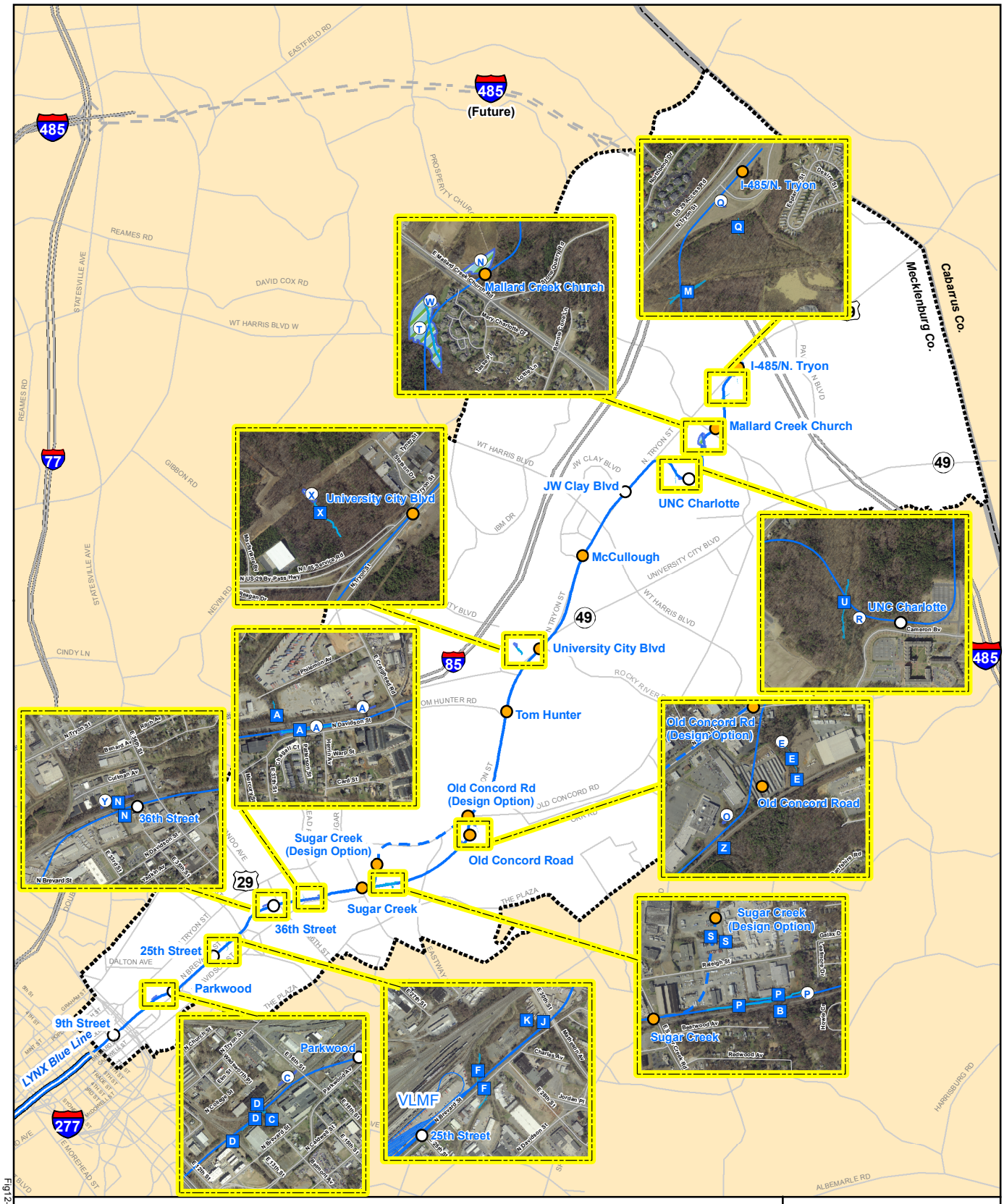
Data Source:
CATS, City of Charlotte GIS, and Mecklenburg County GIS

12/29/09

Watersheds_Figures5_CB_122909.pdf

LYNX Blue Line Extension

Figure 11-2
Waters and Wetlands



Legend

- Northeast Corridor Limits
- Light Rail Transit
- LYNX Existing Light Rail Transit
- Proposed Stations
- Proposed Stations with Park-and-Ride
- Railroads
- Highway
- Major Roads
- Highway (Future)
- County Line
- Streams
- Jurisdictional Wetland
- Jurisdictional Streams

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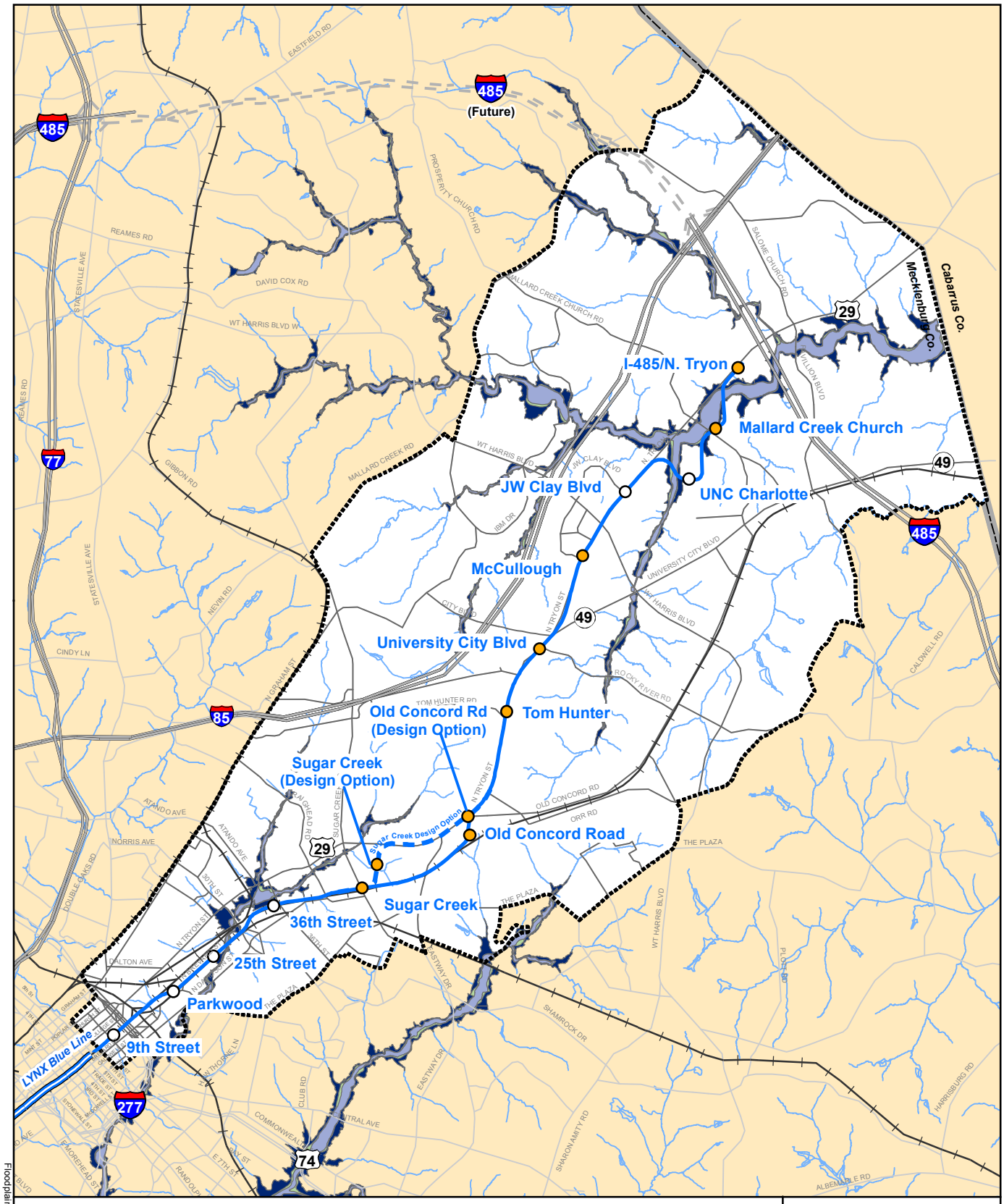
Data Source:
CATS, City of Charlotte GIS, and Mecklenburg County GIS

1/7/09

Fig12-2_Waters_and_Wetland_CB_010710.pdf

LYNX Blue Line Extension

Figure 11-3
Floodplains and Regulated Floodways



Legend

- Northeast Corridor Limits
- Light Rail Transit
- LYNX Existing Light Rail Transit
- Proposed Stations
- Proposed Stations with Park-and-Ride
- Railroads
- Highway
- Major Roads
- Highway (Future)
- County Line
- Streams
- FEMA Floodway
- Community Floodplains
- Community Encroachment Area

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Data Source:
CATS, City of Charlotte GIS, and Mecklenburg County GIS

11.12.09

Floodplains_and_Regulated_FloodwaysRev00.pdf